

New Developments in Portable Backscatter Systems

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July 15, 2014

AS&E[®]

Detect the **difference.**

AS&E product lines



CARGO & VEHICLE INSPECTION

Mobile



ZBV Line

Portal



Z Portal



Sentry Portal

Gantry



OmniView Gantry

PARCEL INSPECTION



Gemini Line 6040, 7555, 100100

PERSONNEL INSPECTION

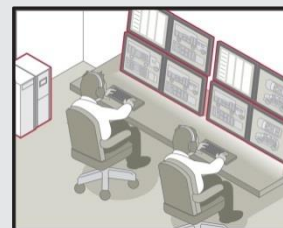


SmartCheck



SmartCheck HT

NETWORKING



ASE Connect

Product Areas & Offerings

ZB

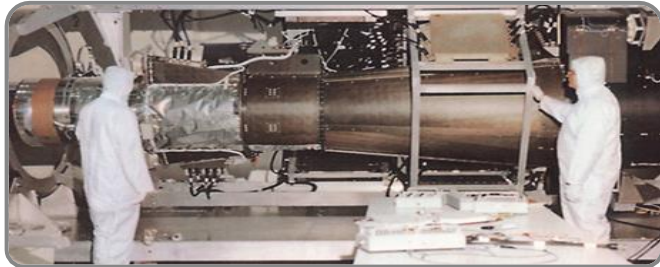
TX

DE

FS

RTD

AS&E at a glance



50+ Years of Experience to Draw From



Unique and Flexible Solutions

Over 600 ZBV's sold worldwide (US state department has about 200)

World's #1 supplier in vehicle detection systems

2002 Nobel prize for extraterrestrial x-ray detection



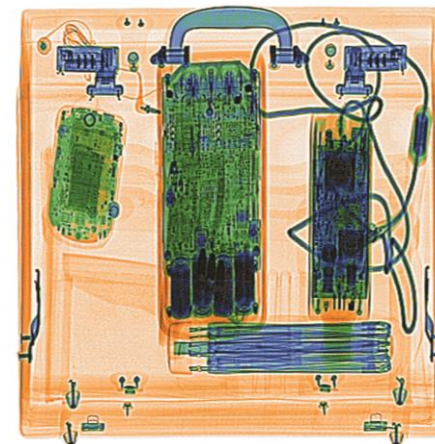
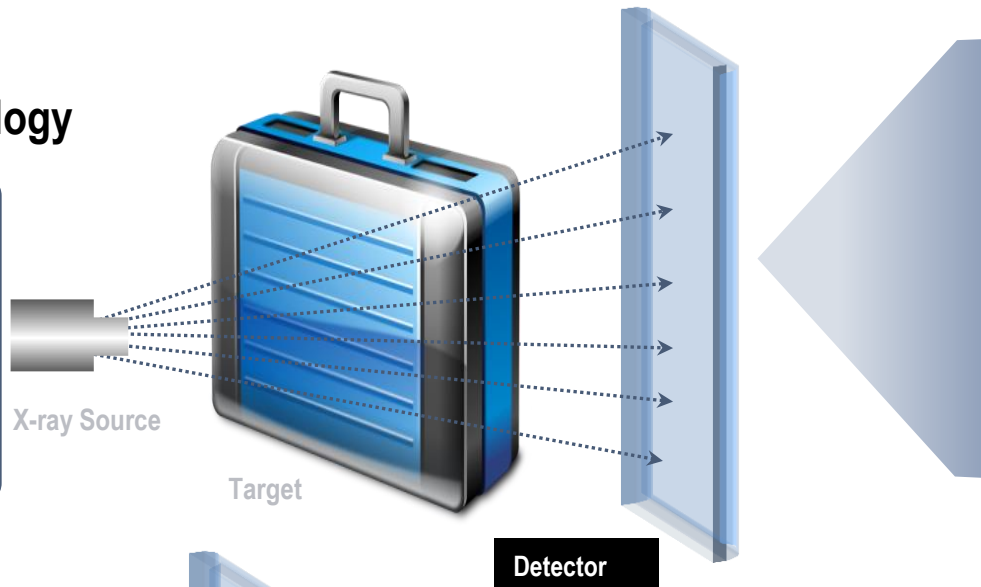
CORPORATE HEADQUARTERS / Billerica, MA **FOUNDED / 1958** **EMPLOYEES 362**
BUSINESS / X-ray Screening & Inspection **FY13 Revenue / \$183M** **STOCK / ASEI**

Transmission X-rays & Backscatter X-rays

Core Technology

TRANSMISSION

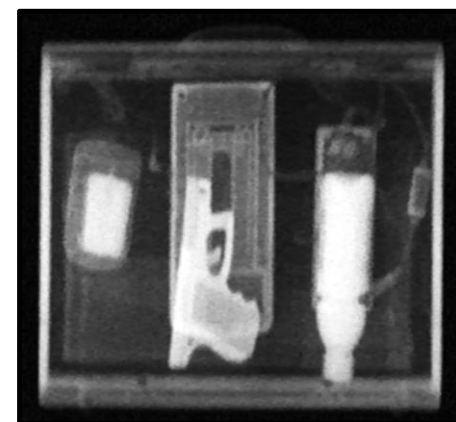
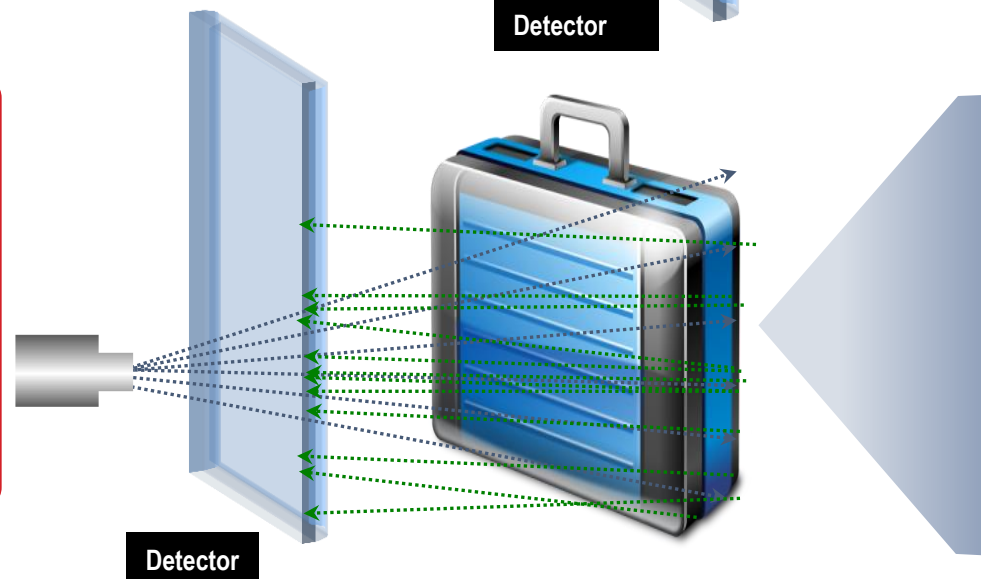
X-rays detect by passing an X-ray beam through a target to a detector on the far side.



TRANSMISSION X-RAY

BACKSCATTER

X-rays detect by reflecting an X-ray beam from a target to a detector on the near side, creating an image that is easy to interpret and understand.



Z BACKSCATTER X-RAY OF THE SAME SUITCASE

Portable / Mobile Backscatter Products



	ZBV	AXISS Family	Portable	Handheld
Energy	225 keV	140keV	70 keV	70 keV
Steel Penetration	8mm	3-5 mm	1-3 mm	none
Viewing Distance	4 m	3 m	1 m	15 cm

Increasing portability

Decreasing Size

Decreasing Penetration

Increasing time to scan a large object

MODULAR BACKSCATTER IMAGER

Motorized Cart Configuration



Powered Cart: push cart, powered by battery

Powered lift raises imager up to 104" (264 cm) high

Size (with imager): 30" (w) x 54" (l) x 52" (h) (lowest level)

76 cm (w) x 137 cm (l) x 132 cm (h)

Total weight (cart and imager): ~950 lbs (430 kg)

Fits through 32" door (81 cm)



At lowest lift position



**At highest lift position -
2.6m (104") high**

Inspecting Vehicles Entering Secure Facilities



VBIED: Rental Truck with 55 Gallon Drums of ANFO simulant



VBIED – 25 Lbs Threat Material in Passenger Door (24" from Target)



Panel Off



Panel ON



VBIED – 25 Lbs Threat Material in Trunk (Side View) (24" from Target)

AS&E®



AXISS FAMILY

AXISS (Advanced X-ray imaging, Single Sided) Family



Small Backscatter Imaging System

Flexible solutions for the detection of explosives, drugs, currency and other organic threats and contraband

Depending on conveyance platform, fits through doors

Sees into objects that are inconvenient to open or difficult to x-ray with transmission systems like bicycles, panel trucks, trunks, planes, boxes, etc.

More portable than a ZBV



Standard Imaging Module Can be used in Multiple Configurations

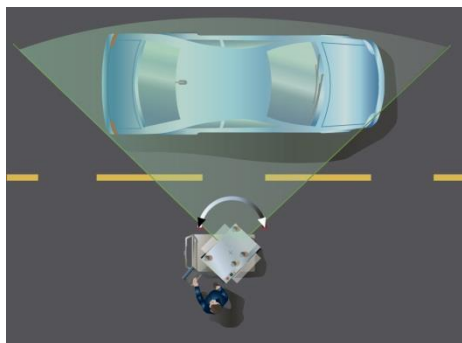
AXISS Systems Imaging Information



X-ray source 140 keV, 600 W

Scan time: Capable of taking quick scan that is lower resolution (as quick as 15s) or a higher resolution scan (as long as 2 minutes)

System provides its own scan motion through Curvilinear Scanning: Turret rotates horizontally while scanning



Field of View: Vertical $\pm 42^\circ$

Middle:
Main viewing
angle



Bottom:
Useful for looking at
objects close up (<3 feet
(1m)) that are on the
ground (e.g. suitcase)

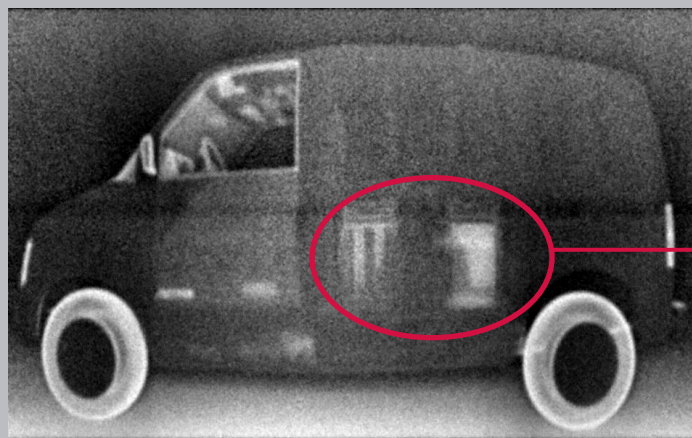


Top:
Useful for looking at
very tall objects
(e.g. truck trailer)

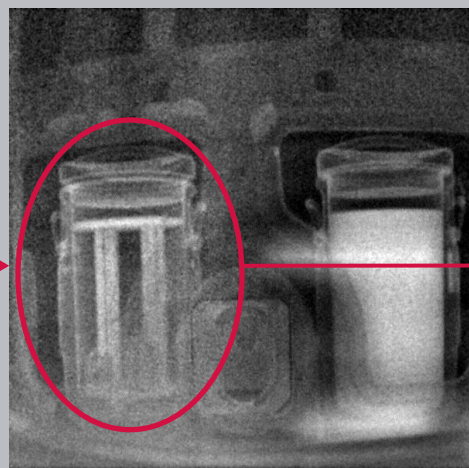


Maximum distance to object being scanned: 12 feet (3.6m)

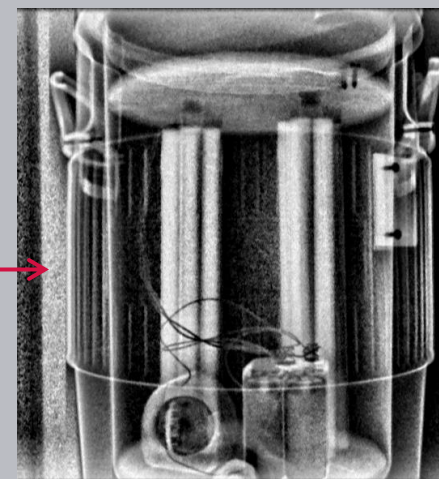
AXISS Family Images: Flexible Scanning



10 ft away



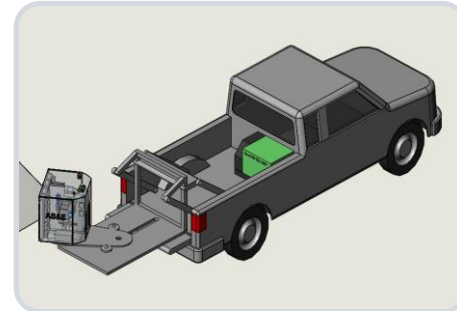
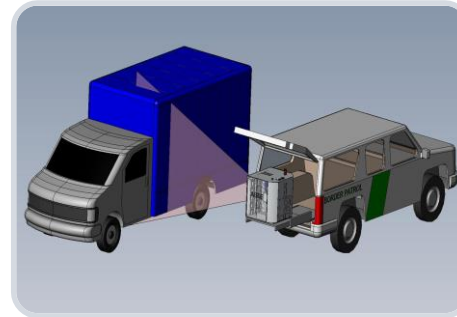
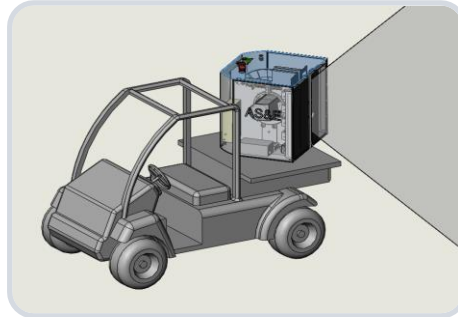
18"



12" High
Resolution scan

**Potential progression of scanning a suspect vehicle:
Whole view of vehicle, closer view of suspicious area, detailed view of suspicious item**

One Imager – Many Uses



AXISS Family



Three programs / three prototypes

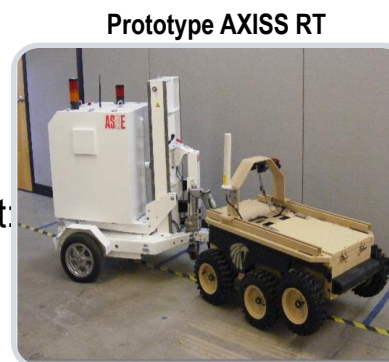
- Base Configuration
 - ▶ Mounted on a motorized handcart
 - ▶ Prototype developed under DHS S&T contract: Modular Bx
- Aviation Scanner
 - ▶ Mounted on a specialized platform for scanning general aviation aircraft
 - ▶ Backscatter imaging ideal for scanning planes for explosives or contraband such as narcotics
 - ▶ Prototype developed under DHS S&T contract: Aviation Scanner
- AXISS Robot:
 - ▶ Smaller than regular AXISS
 - ▶ Remote operation for EOD applications
 - ▶ Prototype developed under CTTSO/TSWG contract: AXISS



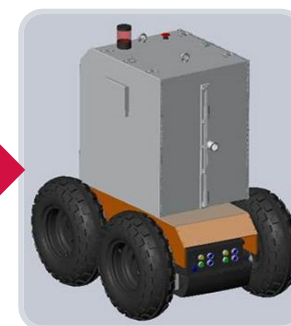
Modular Backscatter



Aviation Scanner



Prototype AXISS RT



AXISS Robot

AXISS Robot Towed (RT) Configuration



Slightly different imager (smaller but 3x slower)

Weight of box: ~300 lbs (135 kg)

Scan time: varies 45s to 2 minutes

Size: 25" x 28" x 25" (64 cm x 71 cm x 64 cm)

Designed for Bomb Squad use

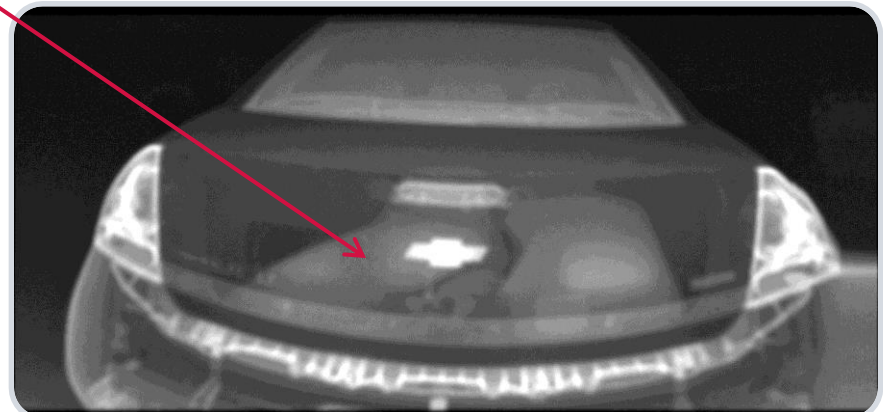
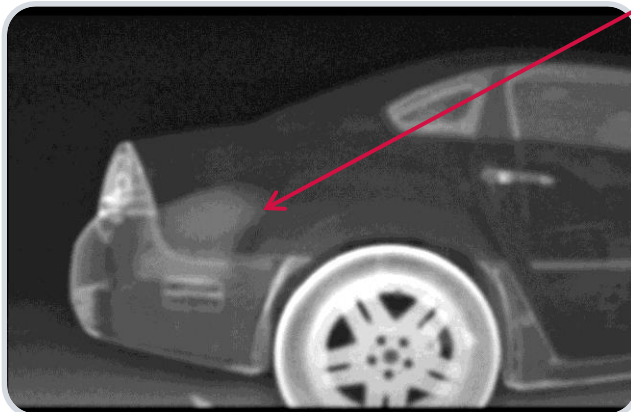
- Analysis of potential VBIEDs

Towable by a bomb squad robot

Provides remote imaging capability



50 lb bags Fertilizer – ANFO Simulant



AVIATION SCANNER

General Aviation Scanner

Scans executive and private planes

Mounted on a rugged platform that includes:

- Omni-directional wheels that allow for precise control and maneuverability
- Motorized lift that can lift imager up to 17 ft (5.2m) high to see under and over wings and fuselage
- Full battery powered operation



General Aviation Scanner: Contraband Inside Aircraft



9mm handgun
in plastic case



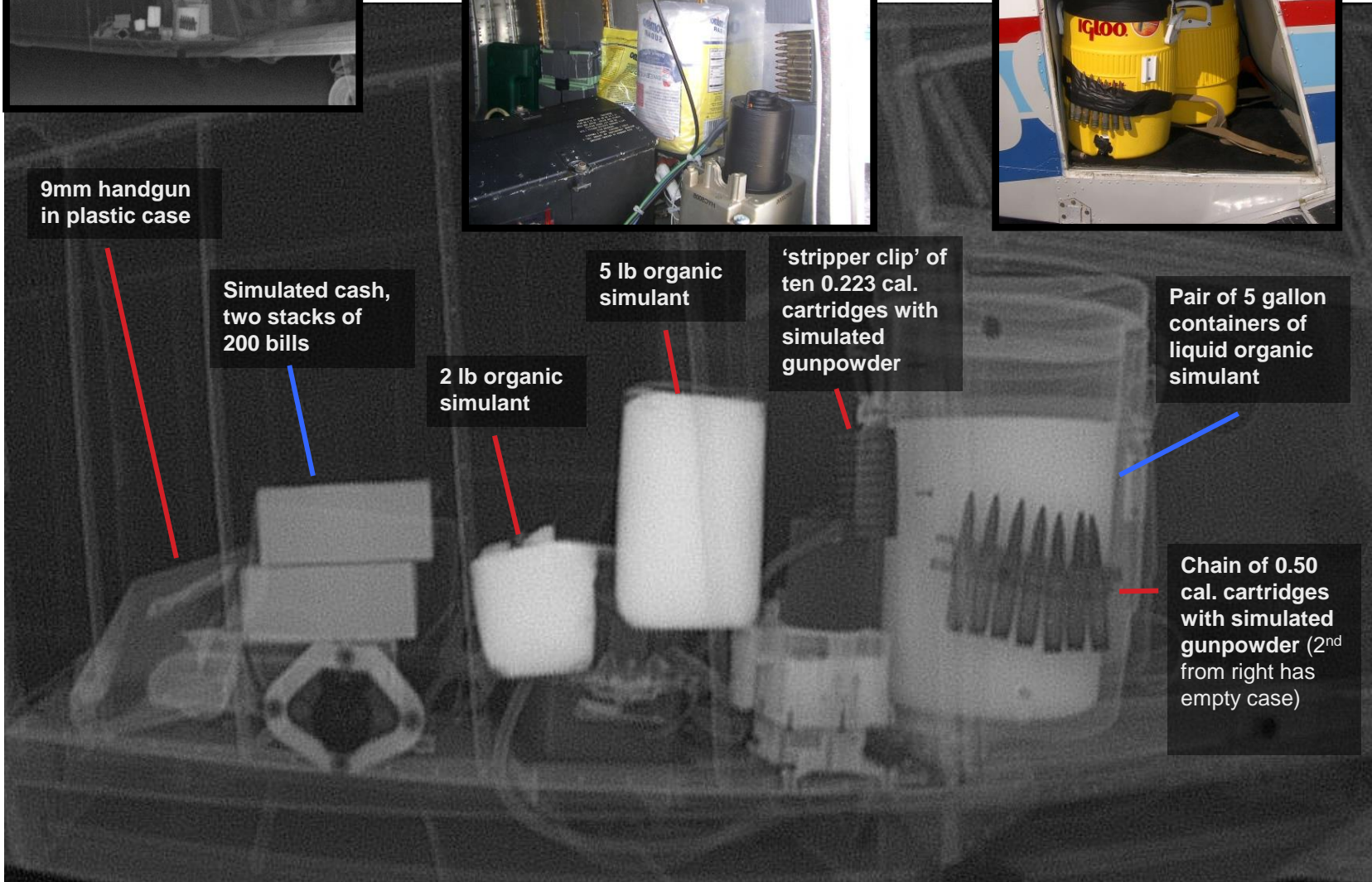
5 lb organic
simulant

2 lb organic
simulant

'stripper clip' of
ten 0.223 cal.
cartridges with
simulated
gunpowder



Pair of 5 gallon
containers of
liquid organic
simulant



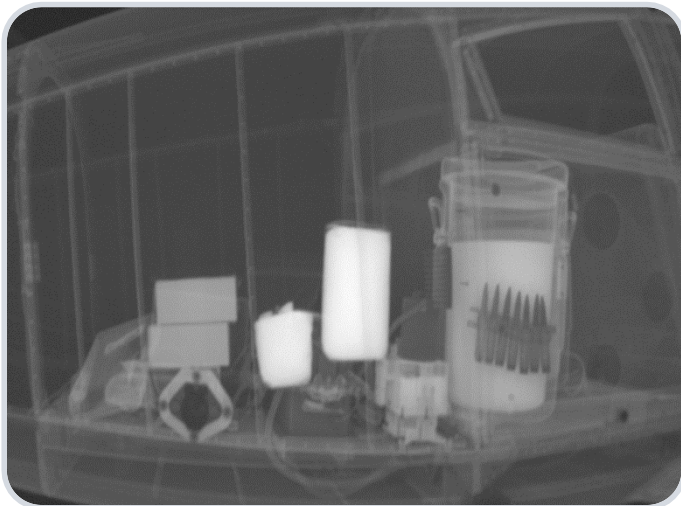
Chain of 0.50
cal. cartridges
with simulated
gunpowder (2nd
from right has
empty case)

Simulated cash,
two stacks of
200 bills

General Aviation Scanner: Aircraft Scan at Various Distances



8 feet

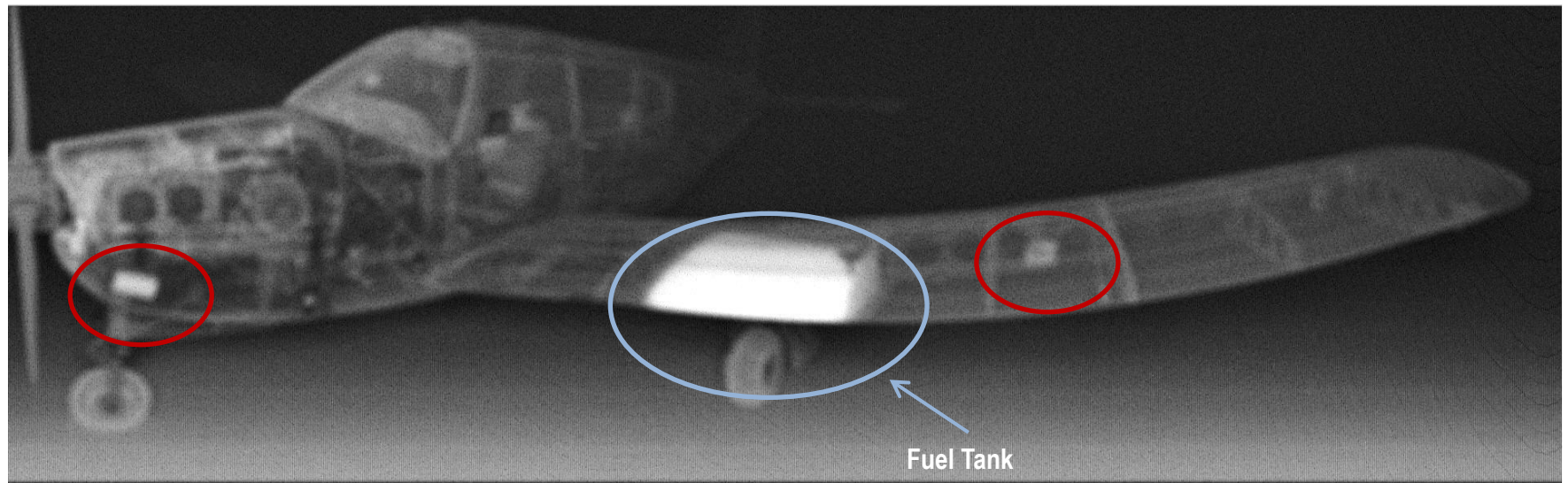
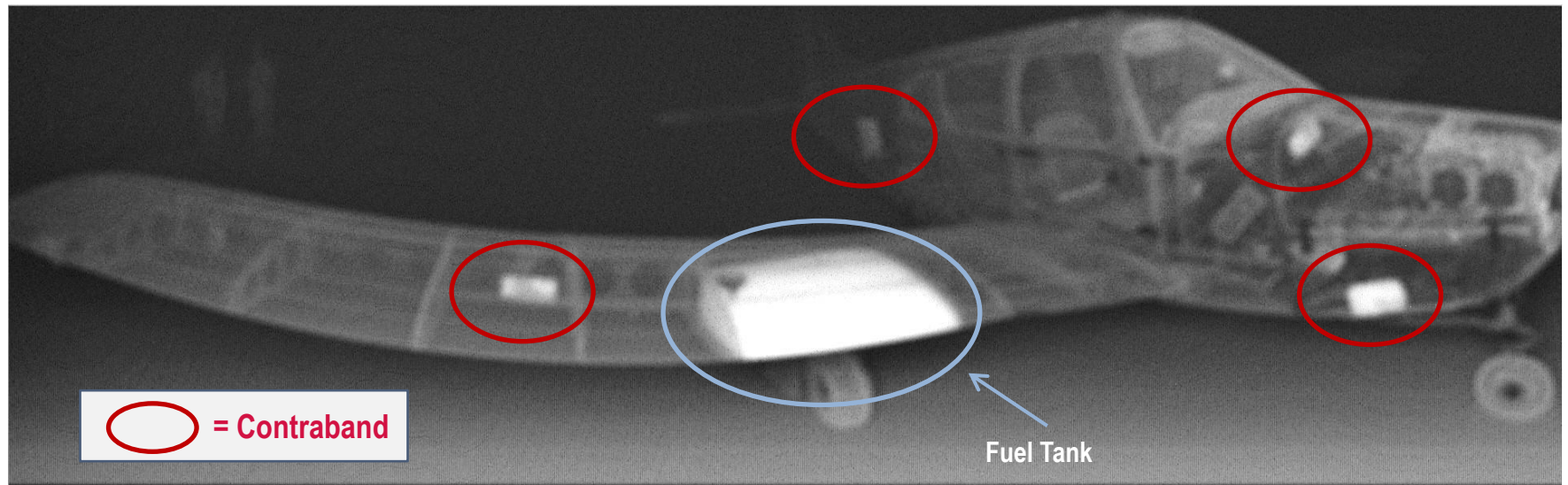


2 feet

4 feet



General Aviation Scanner: Small Plane with Contraband



Aviation Scanner Changes Height and Viewing Angle



Imager in lowered position with the X-ray source tilted upwards so that it looks into the bottom of the aircraft

Imager raised and with the X-ray source tilted downwards so that it looks into the upper section of the aircraft



PORTABLE BACKSCATTER IMAGER

Portable Backscatter



70 keV, 300 W system that is highly portable

Scans both vertically and horizontally and any angle in between

Lift assembly for viewing at different heights

No exclusion zone, operator safe

Standard wall power or battery operated

Can be mounted on any platform

Can penetrate drywall, fiberglass, aluminum, thin steel

Safe for scanning personnel and baggage

Weight: Imager 70 kg, Lift 60 kg

Detectors can be removed for repositioning



Imaging Head Two-Man Carry



Scans Horizontally or Vertically



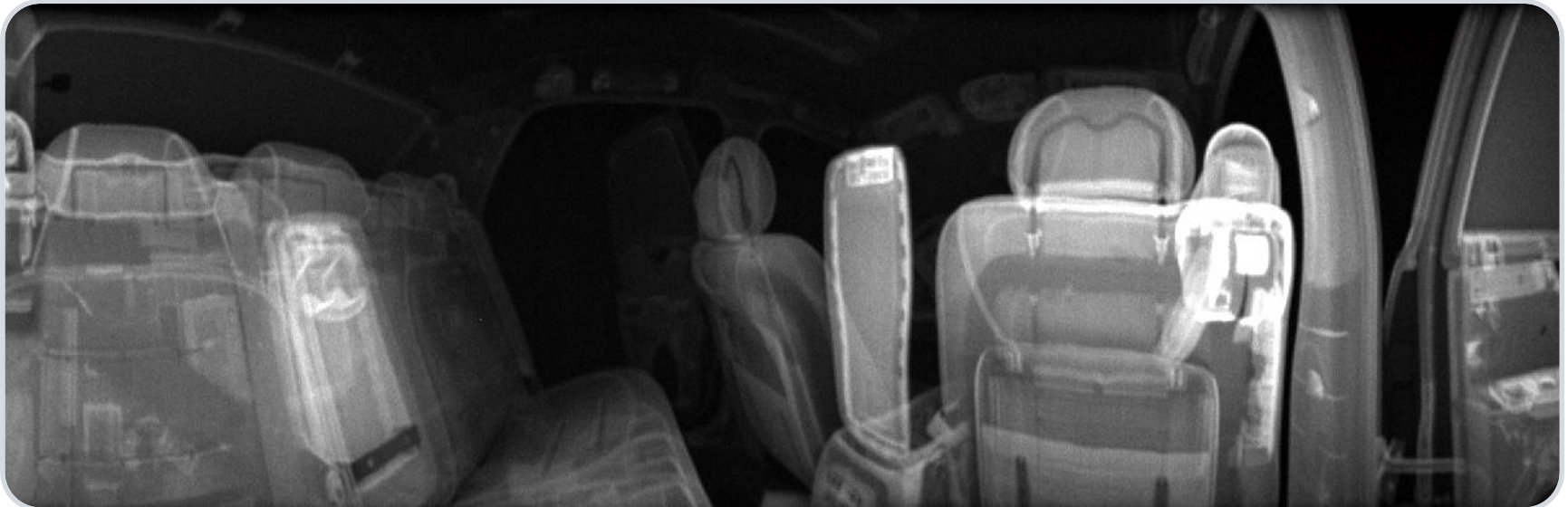
Vehicle Scanning



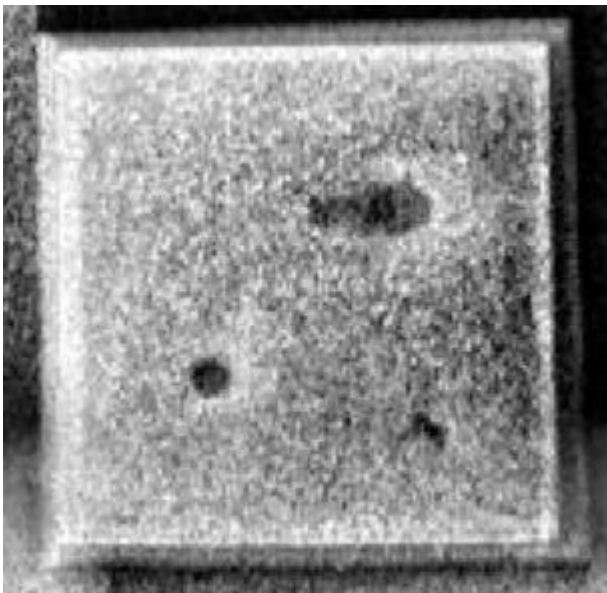
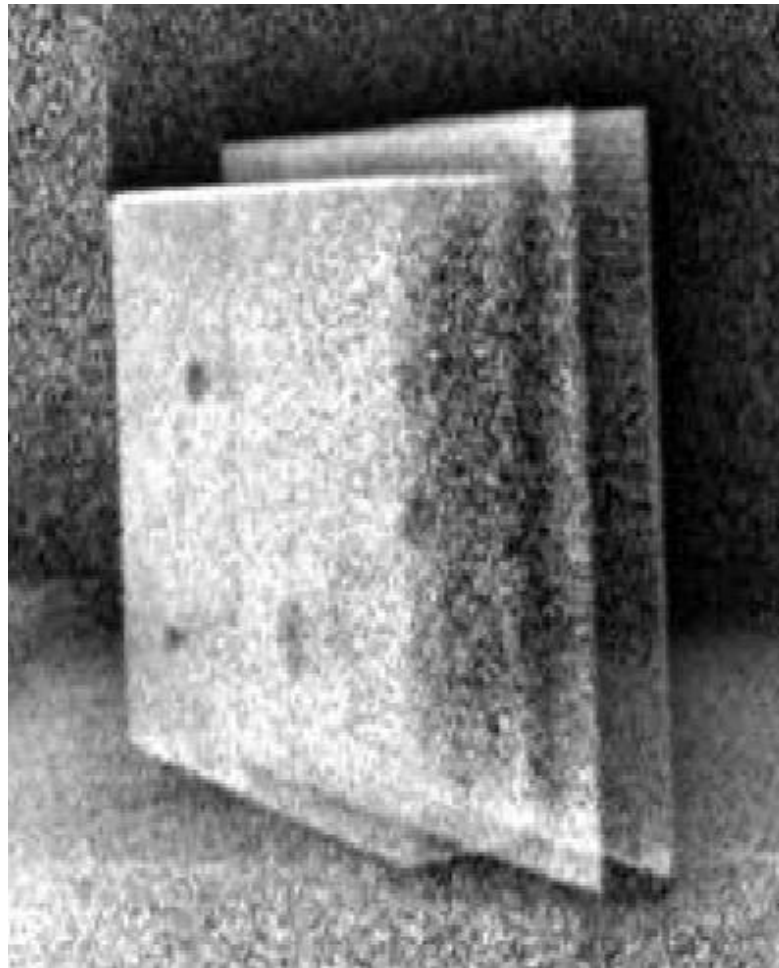
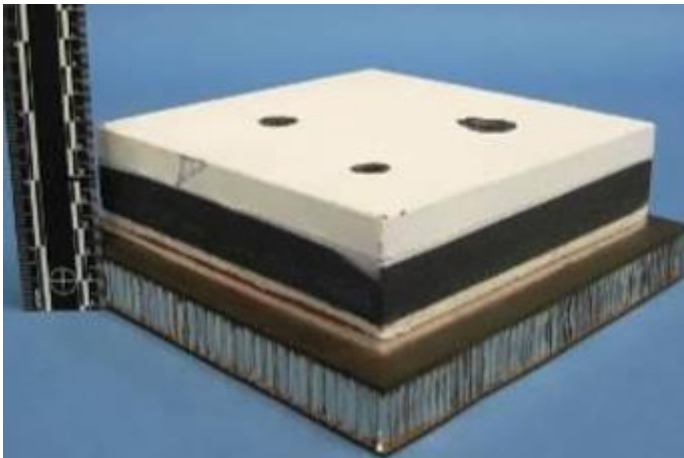
270 degree panorama scan of internal rear passenger area

Imaging head fits completely inside vehicle

Hidden organics (drug and explosive simulants) identified

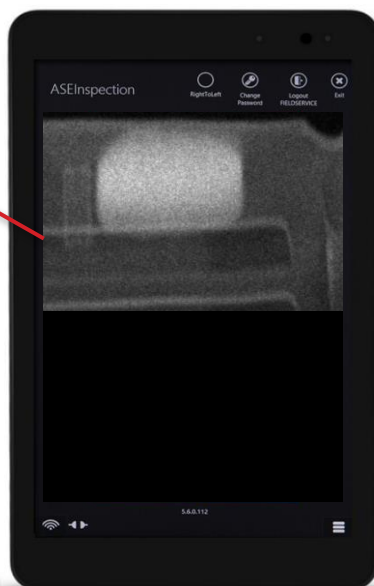


NASA tiles

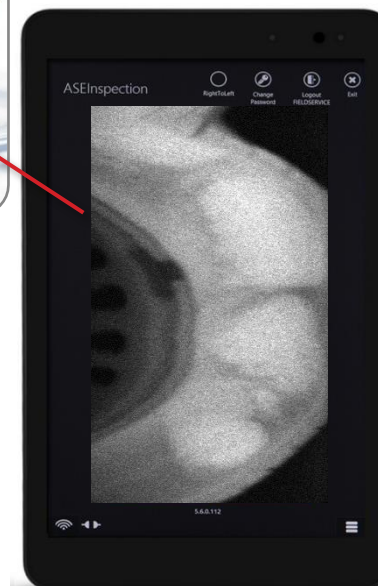


MINI Z

Handheld device can see through non-metallic objects and produces images of potential threats and contraband



Narcotic simulant in bumper



Narcotic simulant concealed in tire

MINI Z Specs



Scanner Dimensions

Length: 11.5 in (29.2 cm)

Width: 9.8 in (24.9 cm)

Height: 7.6 in (19.3 cm)

Weight: 9.2 lbs (4.2 kg)

Energy: 70 kV

Power: 10 W

Operating Time: 4 hrs per battery charge (typical, based on 25% duty cycle)

Scan Speed: 6 in (15 cm) per second (typical)

Operating Environment: IP 54 Rated

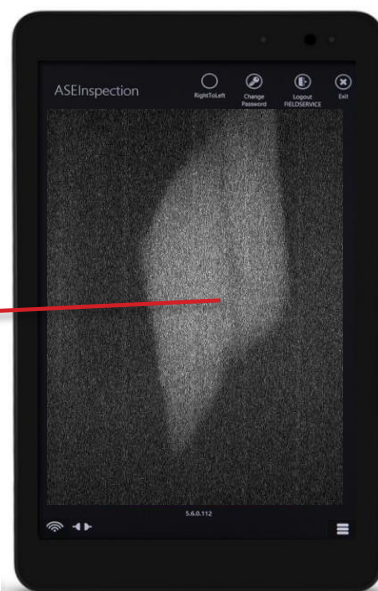
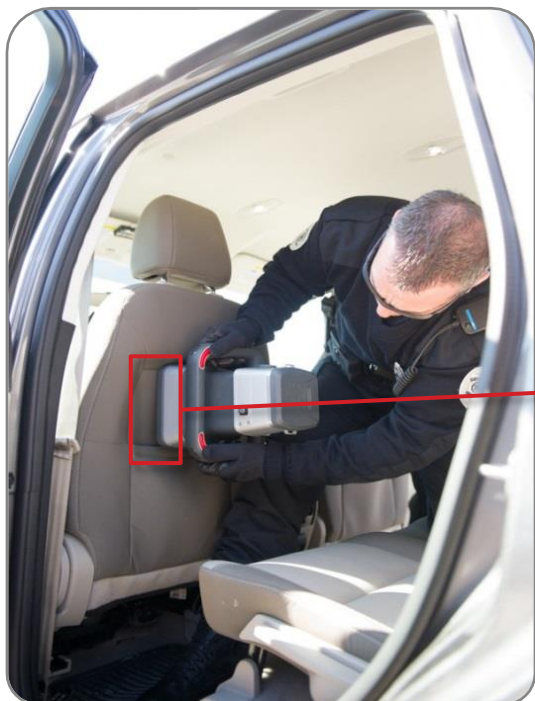
Operating Temperature: 0° C to 45 C (32 F to 113 F)

Imaging of objects



Can scan at any distance and any speed, allowing for increased detection capability or fast scan times

- Examination of walls, vehicle interiors, airplane interiors, pleasure boats, packages, space stations, spacecraft, etc.
- Closer scan distances increase image quality



Narcotic simulant in a car seat



Versatility

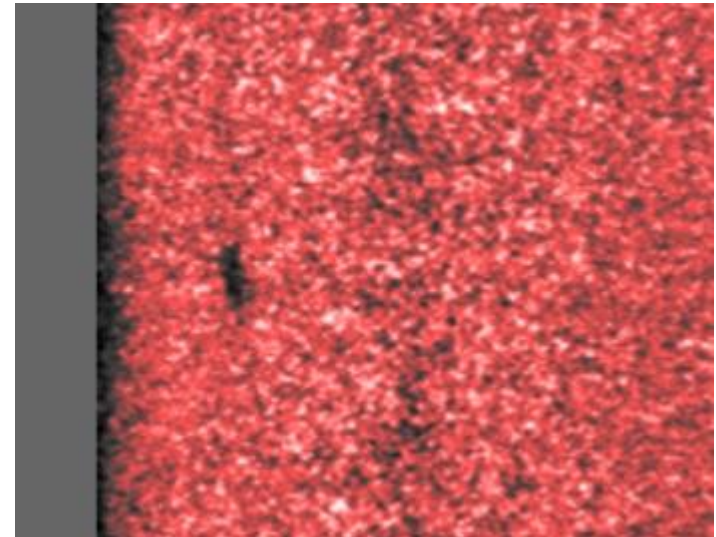
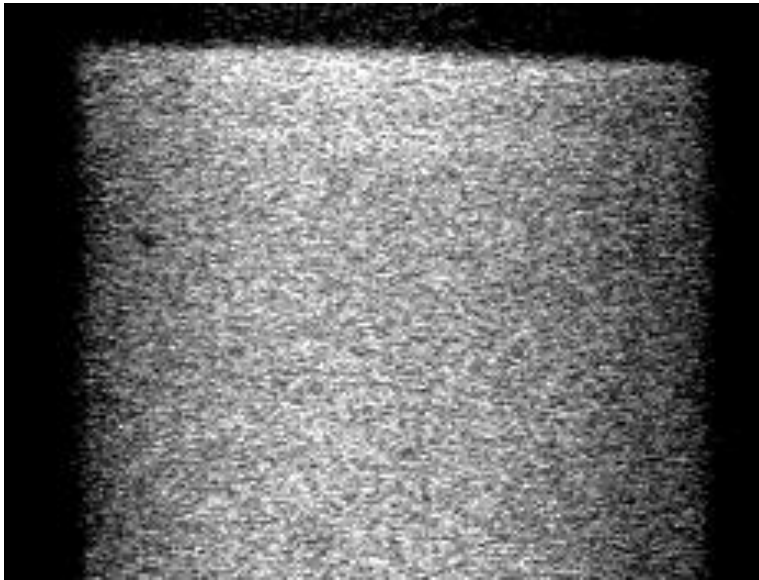
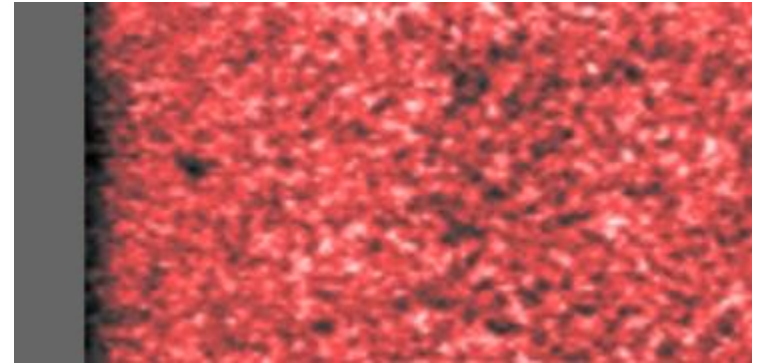


Image organic materials and aluminum

- The MINI Z produces a real-time image of the scan target, highlighting organic materials and thin aluminum
- Does not require physical set-up: enabling immediate operation
- Battery operated, wireless communications (Wi-Fi)
- Intuitive operation: as an operator scans a target, an image appears in real-time on the system's dedicated tablet.

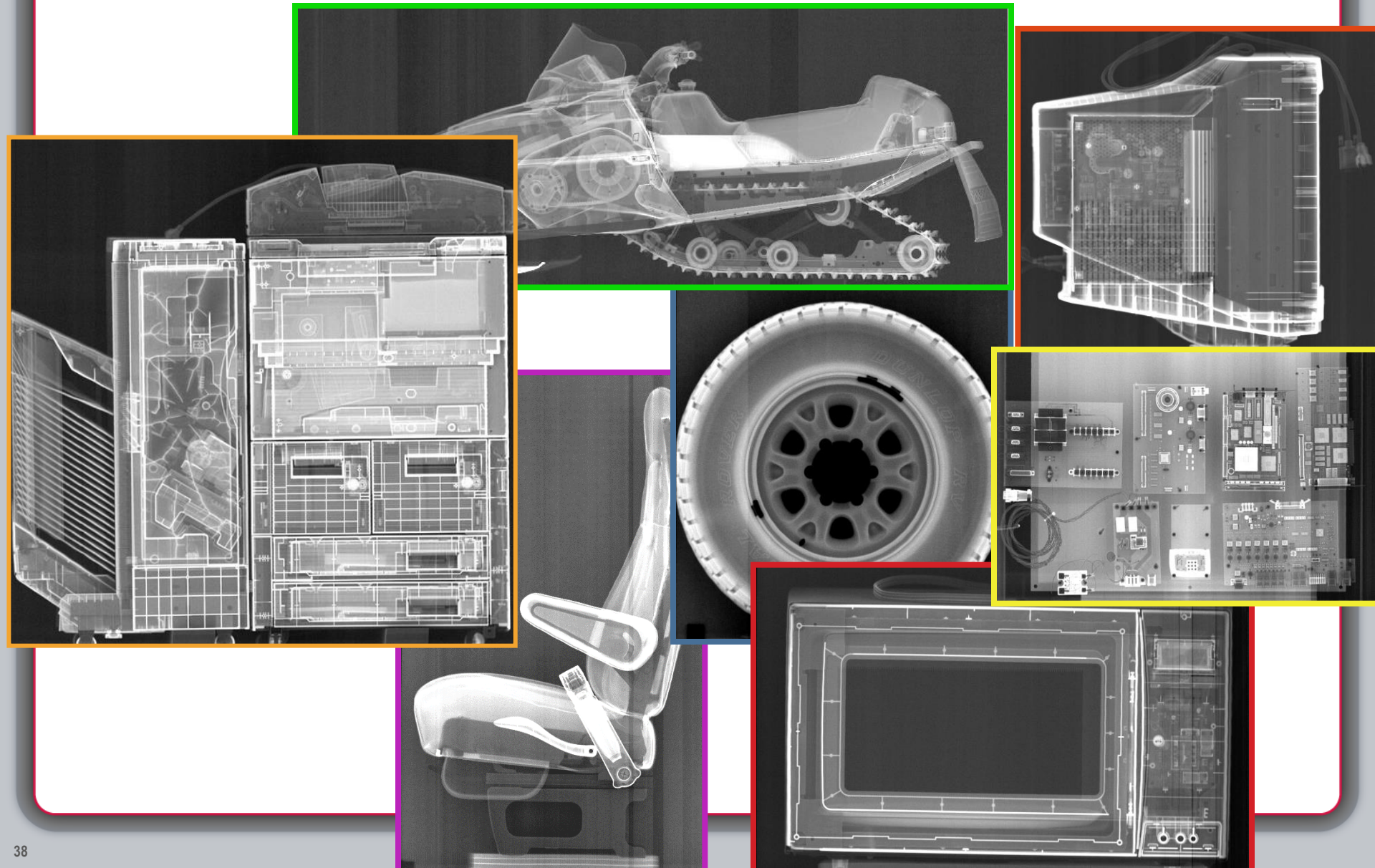


NASA tiles – 3 mm hole



CAPABILITIES AND IMAGE ANALYSIS

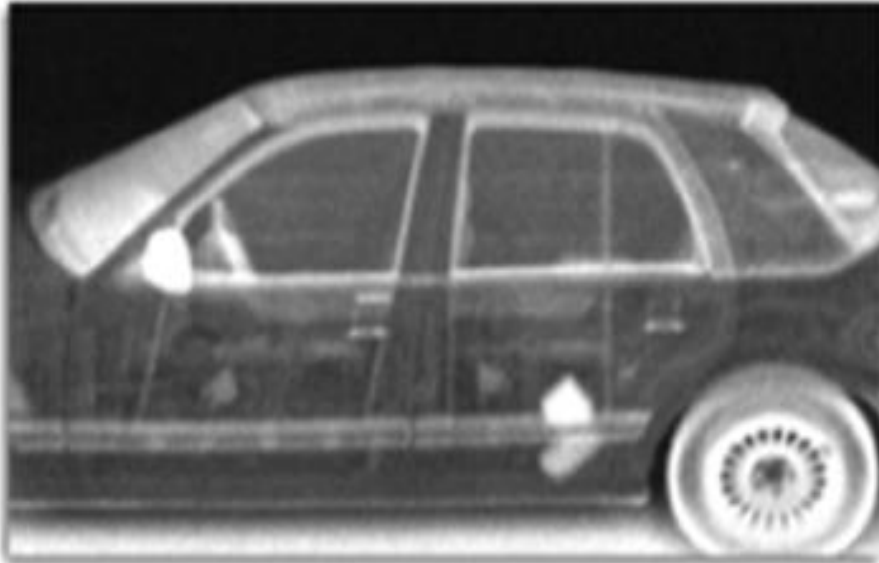
High resolution backscatter imaging



ZBV vs. AXISS Family Imaging



AXISS systems are smaller than ZBV, but slower



ZBV

Distance: 5 ft (1.5 m)

Time: 10 seconds



AXISS Family

Distance: 6ft (1.8 m)

Time: 60 seconds (Modular Backscatter)

Time: 180 s (AXISS RT)

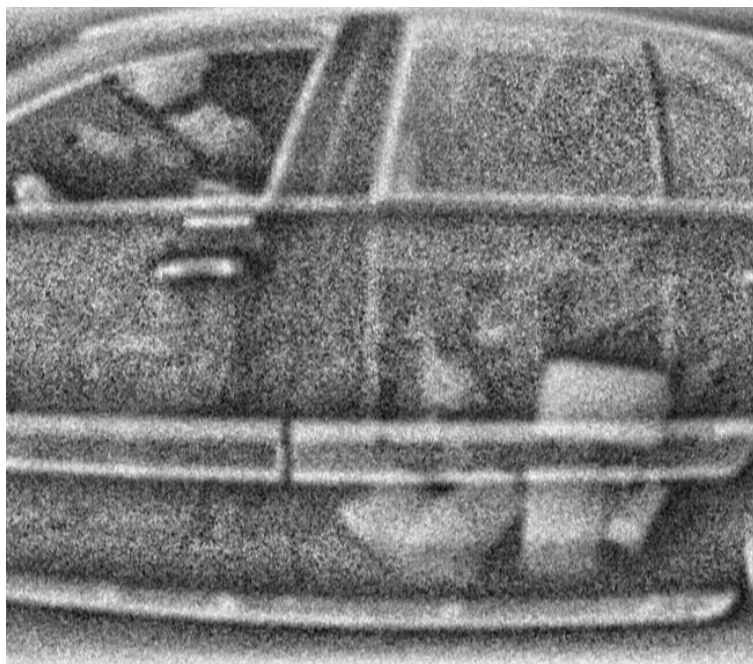
Image Trade-offs

Faster scan speed....

- Faster but grainier

Slower scan speed....

- Slower but sharper



15s (Modular Bx configuration)
45s (AXISS RT configuration)



60s (Modulat Bx configuration)
180s (AXISS RT configuration)

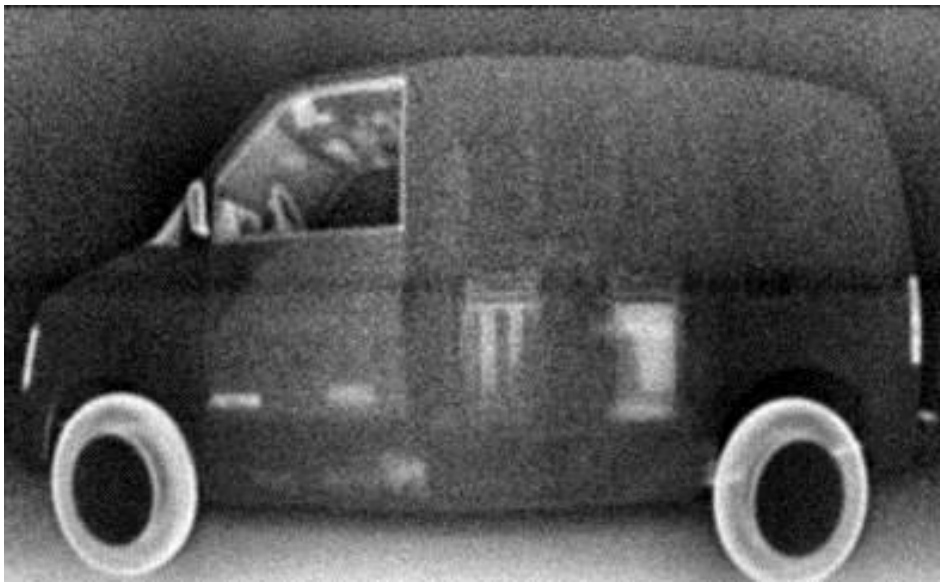
Image Trade-offs

Further away from object.....

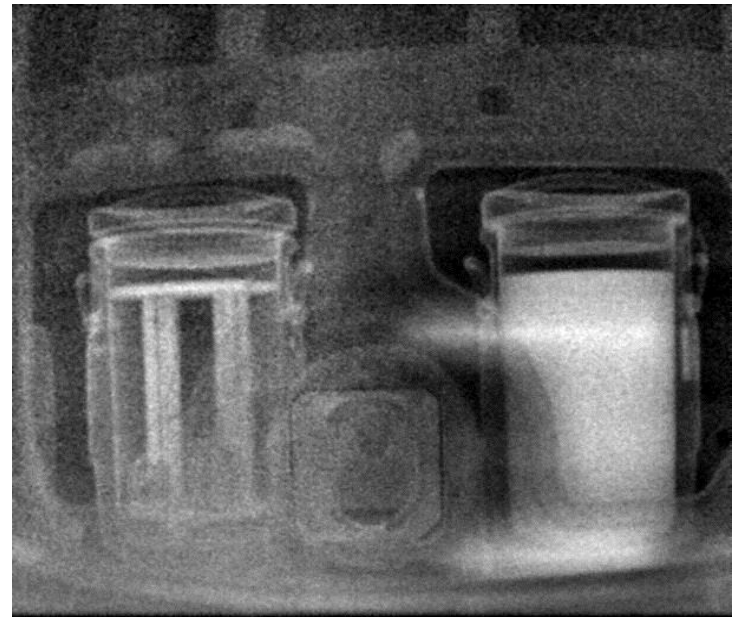
- Wider field of view, decreased spatial resolution due to beam divergence

Closer to object.....

- Smaller field of view, better resolution

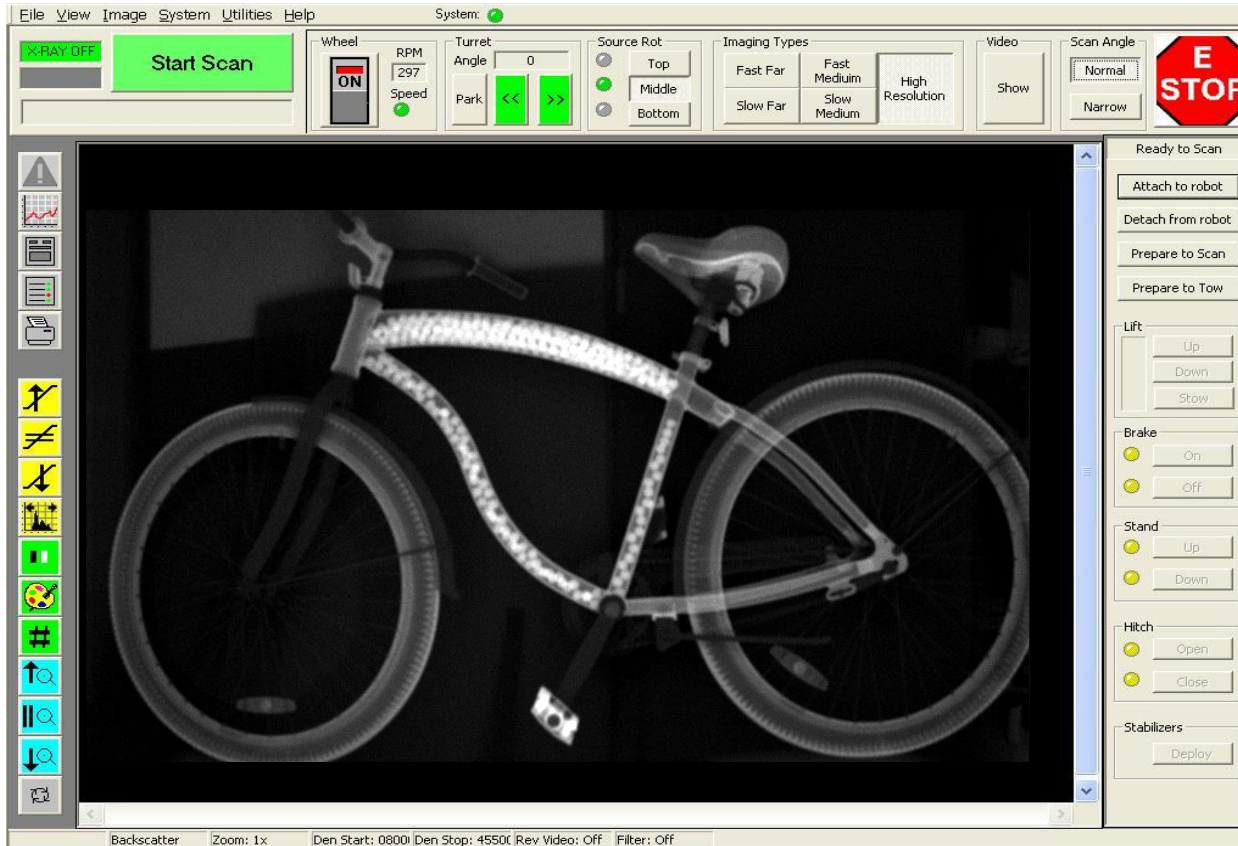


10 feet
(3m)



18 inches
(.5m)

GUI and Operator Control Unit (OCU)



AXISS family systems are controlled by the OCU via radio



Conclusions



MINI Z (handheld): 70 kV, 10 W, 8.5 lbs, unparalleled portability and versatility

Portable Backscatter: 70 kV, 70 kg unit, excellent portability with good imaging

AXISS: 140 kV, larger than PBx but with excellent imaging up close and penetration of steel

Aviation Scanner: AXISS mounted on a 360 degree platform with telescoping arm capable of imaging a plane or other object from variety of angles

Modular Backscatter: 140 kV, larger but can image at a distance through steel and is still portable

Capabilities: Backscatter imaging devices capable of fast scan times (car speeds) and high resolution (sub-mm), though usually not at the same time.

Pick your application and we likely have a solution!